Higher Technical Institute

ELECTRICAL ENGINEERING DEPARTMENT

DIPLOMA PROJECT

DATA ACQUISITION SYSTEM

BY

GEORGIOS PAPAGEORGIOU

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HIGHER TECHNICAL INSTITUTE
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Data Acquisition System

By Georgios Papageorgiou

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Project Supervisor: Dr. C. C. Marouchos

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SUMMARY

This project is intended to lay the foundations for the development of a high sampling rate Data Acquisition System to capture analogue signals (sound), convert them into binary 8-bit samples and store them on an auxiliary memory device such as a floppy disk or the hard disk of the IBM PC. Then using a reverse procedure, the stored 8-bit binary samples can be recalled and recovered back to analog signals.

The conversion frequency can be adjusted with the variable 10K resistor. For best performance a value of 6.8 K Ω is selected which corresponds to a conversion time of about 2us.

The project is divided into two main parts: hardware and software. The first part deals with the hardware design of the system. Although many techniques of designing 2 layer-PCB Boards were studied using suitable software from the market, a Pre-Fabricated ISA – XT Slot Board was selected for fast troubleshooting and quick correction of possible faults. The second part deals with the software; 2 simple programs using the Turbo Pascal V 7.0 were written to provide the control signals (ADC and DAC) and storage of the captured data into a file on the hard disk or floppy disk.

INTRODUCTION

Since 1940 when the first digital computer systems where developed to solve complex scientific problems, electronics and computers in general have dramatically developed. Compact, fast with ever increasing computing power and expanded capabilities computers, "invaded" our lives in areas such as business ,military, industry etc. Besides their power of providing useful tools saving that way people form carrying out elaborate and time consuming tasks, they also provide means of communicating with each other e.g .The Internet.

Computers can be seen as machines which are used to store , process , manipulate and retrieve data after given the necessary instructions i.e. using appropriate programming which is stored in digital form .This project is taking advantage of IBM PC functions to store the data acquired from the outside world i.e. analogue signals. Its purpose is to collect signals in analogue form such as pressure , temperature and sound , convert it into proportional electrical signals and store this data into the computer memory or a disk in a form of a file which can be retrieved , processed and reproduced at a later stage .

Using hardware – a Pre-Fabricated ISA-XT Board with a proper circuitry built on it – and software –proper programming written using Turbo Pascal V7.0 standard compiler –the user is able to sample signals at a high sampling frequency (conversion time =2 us), store them in a file and later retrieve the information at convenience. This project can operate as a PC sound card and therefore can be used to store sound or music from a tape recorder a microphone or a CD player (record) and reproduce (play back) via a speaker .

Particular attention was given to the decoding methods used to address the ports on the card through the ISA extension floor .It was realized that hardware and software depend on each other and cannot operate solely. Special research was carried out in finding special Turbo Pascal V7.0 instructions which substituted the Assembly Language.

An extensive research in applications for designing 2-layer PCBs was achieved although this method was not used in designing the hardware.

Many improvements can be considered in a later stage such as adding signal conditioning circuitry etc though its main goal of getting familiar with the concepts regarding sampling, control signal, decoding etc have been attained.